

What is claimed is:

1. A positive-acting photoimageable composition comprising a photoactive component and a polymer component,
5 the polymer component comprising a polymer that comprises Si atoms and silanol groups,
wherein the polymer has a ratio of silanol groups to Si atoms of about 0.01 to 1.5.
2. The photoimageable composition of claim 1 wherein the ratio of silanol
10 groups to Si atoms is about 0.01 to 1.
3. The photoimageable composition of claim 1 wherein the ratio of silanol groups to Si atoms is about 0.01 to 1.
- 15 4. The photoimageable composition of claim 1 wherein the ratio of silanol groups to Si atoms is about 0.01 to 0.7.
5. The photoimageable composition of claim 1 wherein the ratio of silanol groups to Si atoms is about 0.01 to 0.4.
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6. The photoimageable composition of claim 1 wherein the ratio of silanol groups to Si atoms is about 0.01 to 0.3.
7. The photoimageable composition of any one of claim 1 through 6 wherein
25 the polymer comprises photoacid-labile groups.
8. The photoimageable composition of claim 7 wherein the photoacid-labile groups are ester groups or acetal groups.
- 30 9. The photoimageable composition of any one of claims 1 through 8 wherein the polymer comprises aqueous base-solubilizing groups.

10. The photoimageable composition of claim 9 wherein aqueous solubilizing are fluorinated alcohols, sulfonamide, carboxylic acid and/or thiols.

5 11. The photoimageable composition of claim 9 wherein the aqueous base-solubilizing groups comprise a hexafluoropropyl alcohol group.

12. The photoimageable composition of any one of claims 9 through 11 wherein the polymer contains at least about 20 mole percent of aqueous base-solubilizing
10 groups based on total units of the polymer.

13. The photoimageable composition of any one of claims 9 through 11 wherein the polymer contains at least about 30 mole percent of aqueous base-solubilizing groups based on total units of the polymer.

15 14. The photoimageable composition of any one of claims 9 through 11 wherein the polymer contains at least about 40 mole percent of aqueous base-solubilizing groups based on total units of the polymer.

20 15. The photoimageable composition of any one of claims 9 through 11 wherein the polymer contains at least about 50 mole percent of aqueous base-solubilizing groups based on total units of the polymer.

25 16. The photoimageable composition of any one of claims 1 through 15 wherein the polymer comprises units that are free of photoacid-labile groups and aqueous base-solubilizing groups.

17. The photoimageable composition of any one of claims 1 through 16 wherein the polymer comprises at least two distinct repeat units.

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18. The photoimageable composition of any one of claims 1 through 17 wherein the polymer comprises at least three distinct repeat units.

19. The photoimageable composition of any one of claims 1 through 17 wherein the polymer comprises at least four distinct repeat units.

20. The photoimageable composition of any one of claims 1 through 19 wherein the polymer comprises at least three distinct repeat units of: 1) units that contain photoacid-labile groups; 2) units that are free of photoacid-labile and aqueous base-solubilizing groups; and 3) units that comprise an aqueous base-solubilizing group.

21. The photoimageable composition of any one of claims 1 through 20 wherein the composition is a chemically-amplified positive acting photoresist.

22. The photoimageable composition of claim 1 wherein the composition is a negative-acting photoresist.

23. The photoimageable composition of claim 22 wherein the composition comprises a resin with primary or secondary alcohol moieties.

24. A positive-acting photoimageable composition comprising a photoactive component and a polymer component,

the polymer component comprising a polymer that comprises Si atoms, silanol groups, photoacid-labile groups, and aqueous base-solubilizing groups;

wherein the polymer has a ratio of silanol groups to Si atoms of about 0.01 to 0.4, and the polymer contains at least about 50 mole percent of aqueous base-solubilizing groups.

25. A photoimageable composition comprising a photoactive component and a polymer component,

the polymer component comprising a polymer that comprises Si atoms and a substituted sulfonamide moiety and/or a thiol moiety.

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26. The photoimageable composition of claim 25 wherein the polymer comprises a substituted sulfonamide moiety.

27. The photoimageable composition of claim 25 or 26 wherein the polymer
10 comprises a fluorinated sulfonamide moiety.

28. The photoimageable composition of any one of claims 25 through 27 wherein the polymer comprises a thiol group.

15 29. The photoimageable composition of any one of claims 25 through 27 wherein the polymer comprises an alkylsulfide moiety.

30. A coated substrate comprising:

- 20 a) a polymer composition coating layer applied over a substrate surface;
b) a coating layer of a photoimageable composition of any one of claims 1 through 29 disposed over the polymer composition coating layer.

31. A coated substrate of claim 30 wherein the polymer composition comprises a phenolic resin.

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32. A coated substrate of claim 30 wherein the phenolic resin is a novolak resin or a poly(vinylphenol) resin.

33. A coating substrate of any one of claims 30 through 32 wherein the
30 polymer composition comprises a component containing anthracene groups.

34. A coated substrate of any one of claims 30 through 33 wherein the polymer composition comprises a thermal acid generator compound or reaction product thereof.

5 35. A coated substrate of any one of claims 30 through 34 wherein the polymer composition comprises a crosslinker component.

36. A coated substrate of any one of claims 30 through 35 wherein the polymer composition is crosslinked.

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37. A coated substrate of any one of claims 30 through 36 wherein the polymer composition does not contain a polymer with Si groups.

38. A coated substrate of any one of claims 30 through 37 wherein the
15 polymer composition is not photoimageable.

39. A method for forming a electronic device, comprising:
(a) applying on a substrate a coating layer of a polymer composition;
(b) over the polymer composition coating layer, applying a photoimageable
20 composition of any one of claims 1 through 29;
(c) exposing the photoimageable composition coating layer to activating radiation and developing the exposed photoimageable layer.

40. The method of claim 39 wherein a coating layer of the photoimageable
25 composition coating layer is exposed with radiation having a wavelength of about 248 nm.

41. The method of claim 39 wherein a coating layer of the photoimageable composition coating layer is exposed with radiation having a wavelength of less than
30 about 200 nm.

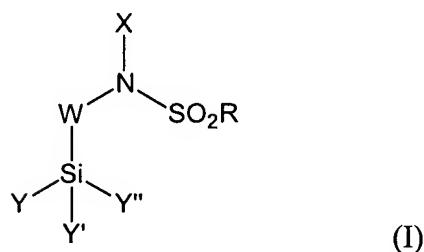
42. The method of claim 39 wherein a coating layer of the photoimageable composition coating layer is exposed with radiation having a wavelength of about 193 nm or 157 nm.
- 5 43. The method of any one of claims 39 through 42 wherein the polymer composition comprises a phenolic resin.
44. The method of claim 43 wherein the phenolic resin is a novolak resin or a poly(vinylphenol) resin.
- 10 45. The method of any one of claims 39 through 44 wherein the polymer composition comprises a thermal acid generator compound.
46. The method of any one of claims 39 through 45 wherein the polymer composition comprises a crosslinker component.
- 15 47. The method of any one of claims 39 through 46 wherein the polymer composition coating layer is crosslinked prior to applying the photoimageable composition thereover.
- 20 48. The method of any one of claims 39 through 47 wherein developing provides a positive tone image of the photoimageable composition.
49. The method of any one of claims 39 through 49 wherein substrate areas bared by development are etched or plated.
- 25 50. An article of manufacture comprising a substrate comprising a coating layer of a photoimageable composition of any one of claims 1 through 29.
- 30 51. The article of claim 50 wherein a polymer composition coating layer is disposed under the photoimageable composition coating layer.

52. The article of claim 50 or 51 wherein the substrate is a microelectronic wafer substrate.

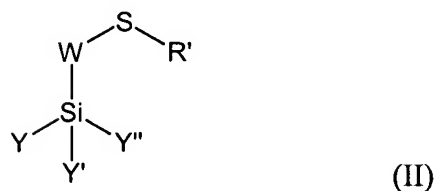
5 53. The article of claim 50 or 51 wherein the substrate is an optoelectronic device substrate.

54. The article of claim 50 or 51 wherein the substrate is a waveguide.

10 55. A polymer comprising groups of the following formula (I) and/or (II):



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wherein in those formulae (I) and (II), Y, Y' and Y'' are each independently a chemical bond, hydrogen or a non-hydrogen substituent;

20 each W is a linker;

X is hydrogen or a non-hydrogen substituent; and

R is a non-hydrogen substituent; and

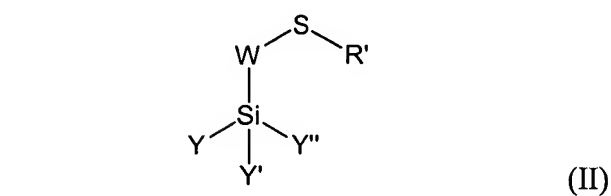
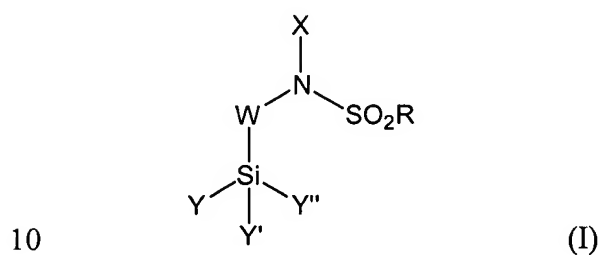
R¹ is hydrogen or a non-hydrogen substituent.

25 56. The polymer of claim 55 wherein the polymer comprises a group of formula (I).

57. The polymer of claim 55 wherein the polymer comprises a group of formula (II).

58. A photoimageable composition comprising a photoactive component and a
5 polymer of any one of claims 55 through 57.

59. A compounds that comprises a group of the following formula (I) and/or
(II):



wherein in those formulae (I) and (II), Y, Y' and Y'' are each independently a
chemical bond, hydrogen or a non-hydrogen substituent;

each W is a linker;

R is a non-hydrogen substituent; and

20 R¹ is hydrogen or a non-hydrogen substituent.